The permeability of the system is then deduced from the comparison of resistances in the air space of the core of the solenoid, and in the air spaces which form the breaks in the magnetic circuit.

The coefficient of electromagnetic momentum is then, by means of known equivalents, expressed in terms of the permeability of the system, and thence, according to the above result, in terms of the configuration of the breaks in the magnetic circuit.

A method is then developed of calculating the coefficient of electromagnetic momentum from the observed mean current during the excitation of a tuning fork of known period.

Four experiments of this description were made, and the value of the terms depending on the configuration of the air spaces analysed and interpreted in connexion with the numerical results thus obtained.

In this manner I was led to distinguish two theoretical cases which were connected by an empirical configuration formula, bridging over the gap between them. The experiments in question agree with the configuration formula to a degree far beyond what could have been anticipated, considering the roughness of the methods employed for the determination of the several elements concerned.

The result is, that in a certain class of electromagnetic systems, when the configuration is given, the permeability and coefficient of electromagnetic momentum can be approximately assigned, and the whole electromagnetic behaviour of the system approximately calculated.

With this theory at my disposal I hope to make further contributions to the knowledge of electromagnetic tuning forks.

II. "On the Skeleton of the Marsipobranch Fishes. Part II. The Lamprey." By W. K. Parker, F.R.S. Received January 10, 1883.

(Abstract.)

In working out this type I have been greatly indebted to the labours of J. Müller, Huxley, Schneider, Balfour, and Scott.

For *materials* I am indebted to two of the above-mentioned anatomists, namely, Professor Huxley and the late Professor Balfour, also to Surgeon-Major Francis Day, of Cheltenham, and Osbert Salvin, Esq., F.R.S.

The transformed skeleton is described in various young individuals of the Sea Lamprey (*Petromyzon marinus*), from four to eight or nine inches in length. The smallest of these was scarcely through its metamorphosis. A specimen of *P. planesi* was worked out at the same

stage. The various sections of the adult were made from the larger river species, *P. fluviatilis*, so also were the various larval specimens; but the embryos were of the small kind—*P. planesi.* These were reared by Messrs. Salvin and Balfour.

I have first described the skeletal structures after metamorphosis, as their condition then is best known to anatomists. I then explain what is seen in the embryo, and after this the larval or *ammocœtine* stage. If my friends are successful in obtaining for me larval Lampreys actually transforming, a Third Part, a *much smaller* paper, will be prepared.

In spite of the invaluable help I have received from my fellow-workers, my task has not been an easy one; it has been taken up again and again, after research into the development of other fishy types.

The suctorial mouth has its highest development in the Lamprey; in the Myxinoids (*Myxine* and *Bdellostoma*) there is no circular disk with horny teeth, but merely an oral fissure, surrounded by barbels, and having inside it a huge tongue beset with two oblique rows of recurved and inturned horny teeth, antagonised by a single ethmoidal tooth. In the larva of the Lamprey the mouth is not circular, and the lower lip is far back, covered by the upper, which is like a hood; there are no teeth of any kind, only moss-like "barbels" or *papillæ* under the upper lip.

In the Tadpole the mouth is suctorial, the lower lip being converted into an imperfect ring, which is completed by the upper lip. Here the cartilage of the lower lip is not a perfect ring, as in the Lamprey, but is in two parts, and is formed into a sort of *horseshoe.* Inside this compound ring there are sharp horny plates or teeth, and the folds of the lips, all round the mouth, are covered with a horny rasp.

Correlated with the perfectly suctorial *lower* lip of the Lamprey, which is a *post-oral* structure entirely, we have the most perfect form of the superficial branchial skeleton, a basket-work of soft cartilage, which appears in the early embryo, and only gains enlargement, fore and aft, with all its snags and outgrowths, after metamorphosis. Besides this there are no rudiments of *internal* branchial arches, such as we find in the Tadpole. The only parts developed *inside* the head-cavities and branchial arches are the generalised and rudimentary mandibular and hyoid arches. In the Tadpole there is no *pier* to the hyoid arch, and the *first cleft* is arrested as a small blind pouch; this state is persistent in the Lamprey. But, after metamorphosis—the lingering latter part of that profound change of structure—the young Frog and Toad acquire a pier to their hyoid arch, right and left. This, however, does not become functional to the arch, much less assist in supporting the mandible, as a "hyomandibular," but is transformed into an osseo-cartilaginous chain—a *stapedio-incudal*

series, specialised correlatively with the expanded rudiment of the first cleft, now enlarged into a *cavum tympani*, with a large "Eustachian" opening. The little mandibles of the Tadpole, which served as arms to carry the divided suctorial disk, and lay across the fore face, become very long, and are often hinged on to their pier behind the occiput, and the cartilages of the suctorial disk straighten out and add to the length of the lower jaw in front. These things show how this *temporary* "Petromyzoid," the Tadpole, blossoms out into unthought-of specialisations, and becomes a *quasi-reptile*, worthy of a place far above the Lamprey, and even far above all other *Ichthyopsida.*

The Myxinoids never gain the level (or platform) of the adult Lamprey or the larval Frog; they acquire no rudiments of vertebræ —only a huge notochord—uniform or non-segmented. But then their *lingual teeth*, rudimentary in the Lamprey, and not present in the Tadpole, are very large, and have a large *buccal* skeleton of their own. They have no *extra-branchial* basket-work, but do develop at least *four* visceral arches, the hyoid (or second) being very large and perfect, but not segmented as in higher fishes. Everything is in a generalised state. But the *first arch* has no lower jaw developed on it, its *lower* part is arrested, and the *two* or *three* proper gill-arches are dissociated from the gill-pouches, which are carried far back, under the spine. I must refer to the main paper (Parts I and II) for details, but I feel sure that every morphologist will agree with me when I assert that these three related, but widely separated groups—the Myxinoids, Petromyzoids, and Anura, are worthy of all the attention that anatomists have given to them, and that if ever we come to see how the Vertebrata have arisen, during time, from *chordate* forms on a lower platform, we shall have to question and cross-question these Marsipobranchs—not once nor twice, but many times.

For myself, I shall be grateful if this limited contribution to the anatomy of the Marsipobranch fishes should draw the attention of other workers, and attract them to this fruitful field of research.

III. "On the Infectivity of the Blood and other Fluids in some Forms of Septic Disease, and the reputed occurrence therein of an Increase of Virulence in Successive Inoculations." By G. F. DOWDESWELL, M.A. (Cantab.), F.L.S., F.C.S., &c. Communicated by Dr. M. FOSTER, Sec. R.S. Received January 15, 1883.

The remarkable fact that in some cases the blood of an animal, intoxicated with putrid matter, becomes itself "infective," capable of